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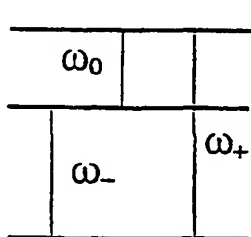
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(54) Title: **THREE-FREQUENCY NUCLEAR QUADRUPOLE RESONANCE (NQR)**



$$|+\rangle \equiv \frac{1}{\sqrt{2}} (|+1\rangle + |-1\rangle)$$

$$|-\rangle \equiv \frac{1}{\sqrt{2}} (|+1\rangle - |-1\rangle)$$

$|0\rangle$

(57) Abstract: This invention involves an apparatus to measure the nuclear quadrupole (NQR) response of a specimen using three frequencies. Three-frequency NQR involves excitation of at least two transitions that causes an observed signal at a third transition frequency. Thus, the transition excited and detected is not irradiated at all. This reduces undesirable interfering signals due to the excitation, for example as a result of acoustic ringing and/or tank circuit ring-down, since the excitation is not applied at the frequency that is detected. This invention will be particularly useful to detect substances selected from the group consisting of explosives and narcotics using nitrogen NQR.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/20513

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01V 3/00
US CL : 324/307, 318

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 324/307, 318, 309

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,B	US 6,566,873 B1 (SMITH et al) 20 May 2003 (20.05.2003), figures 1A-1B; column 1, lines 27-36; column 6, lines 21-25, 52-57; column 9, lines 5-6, 63-67; column 12, lines 17-24; column 23, lines 50-58.	1, 3-20
Y,B		2
Y	US 5,608,321 A (GARROWAY et al) 04 March 1997 (04.03.1997), column 3, lines 13-17.	2

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

PCT/US02/20513

Continuation of B. FIELDS SEARCHED Item 3:

USPAT; US-PGPUB; EPO; JPO; DERWENT; USOCR

search terms: (NQR or nuclear adj quadrupole adj resonance); ((rf or radio adj frequency or "r.f.") near coil); ((perpendicular or orthogonal or ((second or another or different) near direction)) near coil); ((perpendicular or orthogonal or ((second or another or different) near direction)) near probe); (magnetic adj resonance); (excit\$5 near coil)

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